



Programme of Course "Calcolo Delle Probabilità"

<ul style="list-style-type: none"> • Code: I0643 • Type of course unit: Compulsory (Laurea in Ingegneria dell'Informazione curriculum Automatica) • Level of course unit: Undergraduate Degrees • Semester: 2 		
Number of ects credits: (Laurea in Ingegneria dell'Informazione) 6 (workload 150 hours)		
Teachers: Fabio Antonelli (fabio.antonelli@univaq.it)		
1	Course objectives	Students should develop a certain familiarity with the basic probabilistic tools and should become able to - model simple real problems and to propose a solution - solve theoretical problems in discrete and continuous basic probability, using the appropriate mathematical tools. - understand the main probabilistic structures to be able to employ them even in more complex situations; - read a basic probability textbook; - gain access to a more advanced probability course
2	Course content and learning outcomes (dublin descriptors)	<p>Topics of the module include:</p> <ul style="list-style-type: none"> • Probability spaces: combinatorics, axiomatic approach, uniform probability spaces, conditional probability and independence • Discrete random variables Distributions: Bernoulli, binomial, Poisson, Hypergeometric, geometric, Joint distributions and independence Transforms of random variables, distributions of max, min, sums of random variables. Expectation, expectation of a function of a r.v., moments, variance and covariance, correlation, linear regression Examples and applications • Continuous r.v.'s Distribution functions: definitions and properties. Main distributions : uniform, exponential, Gaussian, Gamma, Beta. Distributions of transform, of max and min . Expectation, moments, variance and covariance. Joint distributions, sums of independent r.v.'s, conditional distributions. Conditional expectation and conditional variance Moment generating functions or characteristic functions Multivariate Gaussian laws. • Convergence of r.v.'s and approximation. The law of large numbers, the central limit theorem, normal approximation. • If enough time An introduction to Markov chains: recurrence and transience, invariant probabilities, ergodic theorem. <p>On successful completion of this module, the student should :</p> <ul style="list-style-type: none"> • Students should develop a certain familiarity with the basic probabilistic tools • model simple real problems and to propose a solution • solve theoretical problems in discrete and continuous basic probability, using the appropriate mathematical tools. • understand the main probabilistic structures to be able to employ them even in more complex situations; • being able to report the main points of the theory of probability and its theorems • read a basic probability textbook; gain access to a more advanced probability course
3	Course prerequisites	Fundamentals of Calculus are strongly recommended
4	Teaching methods and language	<p>Lectures and recitation classes</p> <p>Language: Italian</p> <p>Reference textbooks</p> <ul style="list-style-type: none"> • P. Baldi, <i>Calcolo delle probabilità</i>. McGraw-Hill. • D. Ross, <i>Calcolo delle probabilità</i>. Apogeo. • <i>Schaum's outline series : Probabilità</i>.
5	Assessment methods	Written and possibly oral exams.